Pest Alert

United States
Department of Agriculture
Forest Service
**Northeastern Area**
**State and Private Forestry**
NA–PR–03–12
March 2012

# Beech Bark Disease

Beech bark disease (BBD) has been deforming and killing American beech (*Fagus grandifolia*) trees in the Eastern United States since the 1930s. A beech scale insect (*Cryptococcus fagisuga*) first attacks tree bark, creating a wound that provides an entryway for two different fungi (*Neonectria coccinea* var. *faginata* and *Neonectria galligena*) to invade the tree. The fungus grows and kills the living tissue under the outer bark, resulting in cankers that can eventually girdle and kill a tree. Trees that survive may become disfigured.

Beech scale was accidentally introduced into Nova Scotia in 1890 on ornamental beech trees imported from Europe. By the early 1930s, the scale and the Neonectria fungus were found throughout the Maritime Provinces in Eastern Canada and in localized areas of Maine. Since then, BBD has affected New England, New York, New Jersey, Pennsylvania, and West Virginia (figure 1). Localized infestations have been found in Virginia, North Carolina, Tennessee, Ohio, Michigan, and Ontario.

## The Beech Scale

Beech scales are yellow, soft-bodied insects that are 0.5-1.0 mm long as adults (figure 2). They feed only on American and European (*Fagus sylvatica*) beech trees.

The beech scale has one generation per year. Adults lay eggs on the bark in midsummer and then die. Eggs hatch from late summer until early winter. The immature insects, called first-stage nymphs, have functional antennae and legs and can move to new locations. Nymphs are also spread by wind, birds, and humans that move firewood that harbors nymphs. When a nymph finds a suitable host tree, it starts feeding. First-stage nymphs develop into legless second-stage nymphs that don't move. They secrete the "white wax" that eventually covers their bodies through adulthood (figure 3). The second-stage nymphs overwinter and molt into adults the following spring.

Trees newly infested with scale have small spots or patches of white wax on the trunk, usually on rough bark surfaces. As the scale population builds, large branches and the entire trunk of the tree may become covered with white wax.

## The Fungus

The fungi produce fruiting bodies that are tiny, bright red, and lemon shaped in clusters on the bark (figure 4). The mature spores are released in the fall if there's enough moisture. Tarry spots (dead tissue that oozes reddish brown fluid) is also an early symptom that trees are infected with Neonectria species (figure 5).

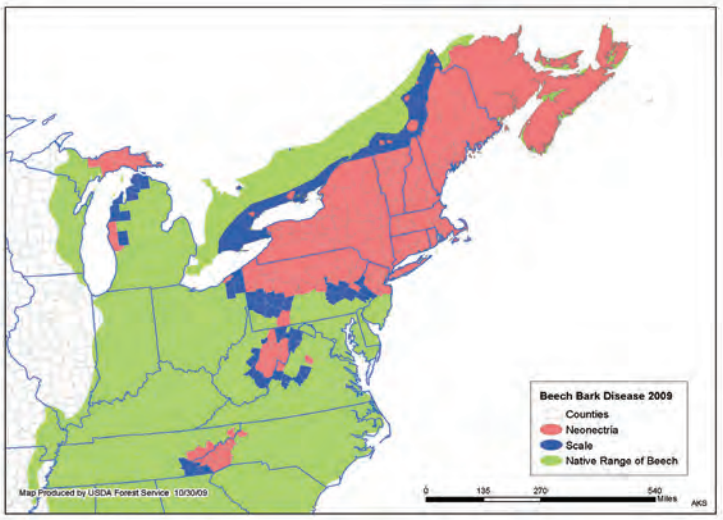


Figure 1.—Distribution map of beech bark disease as of 2009.

Figure 2.—The scale insect.

Figure 3.—White waxy covering.

Figure 4.—Fungal fruiting bodies.

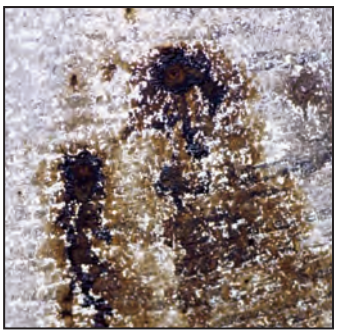

Figure 5.—Tarry spots on the bark.

## Additional Symptoms

On some dying trees, the leaves do not fully form, which makes the tree crowns look thin. The leaves stay on the trees, but become yellowish as summer progresses. Another symptom of BBD is the distinct orange color when the outer bark is cut away where Neonectria is actively invading the bark. Other symptoms include noticeable cracking of the bark on the tree trunk; cankers; and deformed, defective wood. Other insects and fungi quickly invade the wood killed by beech bark disease. This weakens the tree and makes it more likely to break during wind events, which is called "beech snap" (figure 6).

## Three Phases of BBD

- *Advancing Front:* Trees are infested with beech scale but not yet infected by Neonectria. Beech scale can be present for several years before Neonectria infection occurs.
- *Killing Front:* Beech scale populations are high, Neonectria infection is abundant, and tree mortality is heavy.
- *Aftermath Forest:* These areas have experienced the first wave of beech mortality. They typically have smaller beech scale populations. Residual beech trees are mostly defective and declining. Smaller beech trees usually sprout from the roots and can form dense thickets that are highly susceptible to the disease. Larger trees that remain and appear to have escaped BBD are thought to be resistant to BBD.

## Control and Management

Some scale insects may die due to weather conditions, but it is generally not enough to reduce the impacts of this disease. There are few controls for beech bark disease. One important control method is preventing the movement of nursery stock or other materials that may harbor the beech scale insect. Insecticides, oils, and mechanical controls can be used on high-value ornamental trees, but they are labor intensive and not always successful.

Controlling BBD in a forest setting is costly. Using biological controls—the ladybird beetle (*Chilocorus stigma*) that preys on the beech scale insect and a fungus (*Nematogonum ferrugineum*) that parasitizes the Neonectria fungus—is not a realistic option because their impacts are limited and they have not been shown to effectively control BBD.

Figure 6.—Beech snap.

Using silvicultural methods to manage tree species composition, size, age, and vigor may reduce the development of BBD in a forest. It is important to use harvesting methods that minimize root injury of susceptible trees to reduce root sprouting. Retaining beech trees that are free of the scale and/or fungal infection in a forest provides a source of BBD-resistant seeds and sprouts, which helps increase the proportion of healthy, resistant beech trees.

Another developing approach to restoring and regenerating American beech is to identify, graft, and propagate BBD-resistant trees and develop seed orchards and enhanced seed productions areas from these resistant trees. These seed and tree sources can potentially be used to increase the proportion of healthy, resistant beech in a forest.

Using a combination of silvicultural methods and resistant seed stock may allow healthy American beech to remain a valuable component of North American forests throughout its natural range.

### Photographs:

Figure 2: Joseph O'Brien, USDA Forest Service, Bugwood.org

Figure 3: Karen Felton, USDA Forest Service

Figure 4: Andrej Kunca, National Forest Centre - Slovakia, Bugwood.org

Figure 5: Joseph O'Brien, USDA Forest Service, Bugwood.org

Figure 6: Joseph O'Brien, USDA Forest Service, Bugwood.org

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USDA Forest Service
Northeastern Area
State and Private Forestry
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Newtown Square, PA 19073
www.na.fs.fed.us